10 1/1 OCTAVE ANALYSER

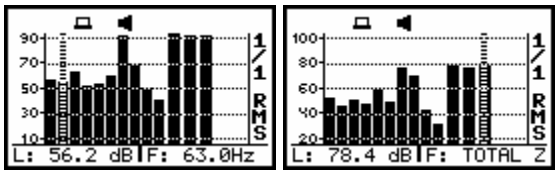
The instrument operates as **1/1 OCTAVE** analyser in a very similar way to the **SLM** mode and, in addition, **1/1 OCTAVE** analysis is performed in parallel with the **SLM** operations. All ten, 1/1-octave digital pass-band filters (with the centre frequencies from 16 kHz down to 31.5 Hz; in base two system) are working in the real time with **the weighting filters**: **Z**, **A** or **C** selected in the **SPECTRUM** (*path: MENU / INPUT / SPECTRUM / FILTER*) and **the linear RMS detector**. Additionally, the **TOTAL** RMS values for the full frequency range with the **A**, **C** and **Z** weighting filters are calculated and displayed.

***Notice**: The **TOTAL RMS** results are measured with the weighting filters: **A**, **C** and **Z** without taking into account the settings of the **SLM** profiles. The spectra are always linearly averaged. Thus, the **TOTAL** values from **1/1 OCTAVE** analysis can be different from those obtained for the **SLM** profiles (if the **RMS INTEGRATION** was set as **EXPONENTIAL**).*

The **SVAN 953** instrument, which in SLM mode operates in one, wide measurement range, as **1/1 OCTAVE** analyser it operates in **two** ranges, called **LOW** and **HIGH**, which can be selected in the **MEASUREMENT RANGE** window *(path: MENU / INPUT / MEASUREMENT RANGE)*.

The results of **1/1 OCTAVE** analysis (so-called spectrum) can be examined by the user on a display in so-called **SPECTRUM** presentation mode. The availability of this mode can be switched on or off by the user (*path: MENU / DISPLAY / DISPLAY MODES / SPECTRUM*).

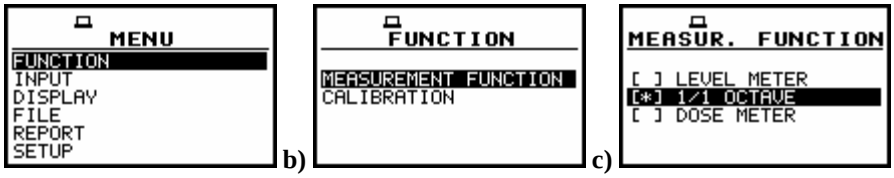
1/1 OCTAVE spectrum for all ten centre frequencies of 1/1 octave pass-band filters together with the **TOTAL** RMS values measured with **A**, **C** and **Z** weighting filters are presented in the switched on **SPECTRUM** mode. The read-out of the interested value of **1/1 OCTAVE** spectrum can be done by means of the cursor controlled by the **<◄>**, **<►>** push-buttons. Below the spectrum lines, the numerical value in dB (**L**evel) and the selected 1/1 octave filter (its centre frequency) or the selected **TOTAL** (indicated by the letter **A**, **C** or **Z**) are displayed.



Displays in 1/1 OCTAVE analysis in the SPECTRUM display mode

10.1 Selection of 1/1 OCTAVE analysis mode

In order to select the **1/1 OCTAVE** analysis mode the user has to enter the **FUNCTION** list by pressing the **<MENU>** push-button, then - select by means of the **<▲>**, **<▼>** (or **<◄>**, **<►>**) push-buttons the **FUNCTION** text and finally - press the **<ENTER>** one. Then, the user has to open the **MEASUREMENT FUNCTION** sub-list (to select the **MEASUREMENT FUNCTION** text using the **<▲>**, **<▼>** (or **<◄>**, **<►>**) push-buttons and press the **<ENTER>** one when this text is displayed inversely).



Main list with FUNCTION text selected (a), FUNCTION list opened with MEASUREMENT FUNCTION text selected (b), 1/1 OCTAVE mode activated in MEASUREMENT FUNCTION window (c)

1/1 OCTAVE mode is selected by placing the special character in the line with **1/1 OCTAVE** text. The position of the character can be changed using the **<▲>**, **<▼>** (or **<◄>**, **<►>**) push-buttons. After placing the character in the line with **1/1 OCTAVE** text, the user has to press the **<ENTER>** push-button, which closes the **MEASUREMENT FUNCTION** sub-list and confirms the selection. After pressing the **<ESC>** push-button the sub-list is also closed but **any changes are ignored**.

***Notice**: It is not possible to change the current function during the measurements. The instrument displays in this case for about 2 seconds the text: **"MEASUREMENT IN PROGRESS"**. In order to change the current measurement function the instrument must be stopped!*

Display with the text informing the user about the currently performed measurements

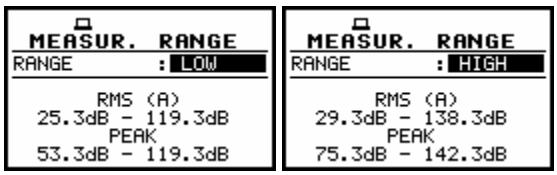
10.2 Selection of parameters of 1/1 OCTAVE analysis

The execution of **1/1 OCTAVE** analysis depends on the certain number of the parameters, which can be set in the different sub-lists of the **INPUT** list. Namely, the user can set there the range of the measurements (*path: MENU / INPUT / MEASUREMENT RANGE*) and **FILTER** (*path: MENU / INPUT / SPECTRUM FILTER*). Additionally, the user can be informed about the **BAND** of the analysis (*path: MENU / INPUT / SPECTRUM / BAND*) and switch on or off the registration of **1/1 OCTAVE** spectra in the **LOGGER** (*path: MENU / INPUT / SPECTRUM LOGGER*). The output of the selected 1/1-octave filter can be also used as the triggering signal in LOGGER TRIGGER window (*path: MENU / INPUT / TRIGGER SETUP / LOGGER TRIGGER / SOURCE*).

10.2.1 Measurement range selection in 1/1 OCTAVE analysis - MEASUREMENT RANGE

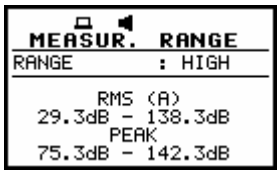
The selection of the input range is possible after entering the **MEASUREMENT RANGE** window. In order to open this window the user has to select the **MEASUREMENT RANGE** text in the **INPUT** list by means of the **<◄>**, **<►>** push-buttons and press the **<ENTER>** one.

In **1/1 OCTAVE** analyser (differently than in **SLM** mode) the user can select (by means of the **<◄>**, **<►>** and **<ENTER>** push-buttons) the input ranges specified in Appendix C, named as **LOW** and **HIGH**. The return to the **INPUT** list is made after pressing the **<ESC>** push-button (ignoring the changes) or **<ENTER>** push-button (confirming the selection).



MEASUREMENT RANGE window in 1/1 OCTAVE analyser

Notice: It is not possible to change the measurement range** during the execution of the measurements. It is possible to open different lists and sub-lists but the positions in these lists are not displayed inversely and so - not accessible. **The "Loudspeaker" icon** indicates that the instrument is **in the measurement process. In order to change the range the measurement must be stopped!



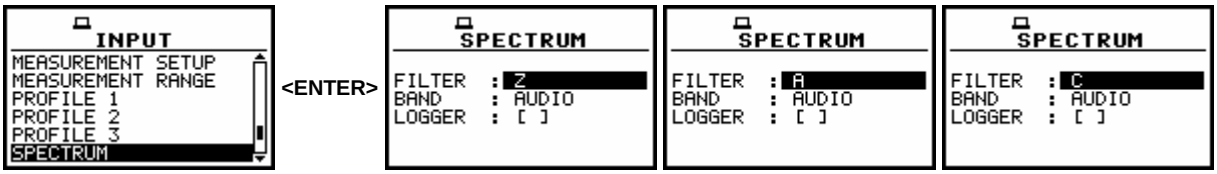
MEASUREMENT RANGE window not accessible during the measurement

10.2.2 Weighting filter selection in 1/1 OCTAVE analysis - FILTER

The **SPECTRUM** sub-list (*path: MENU / INPUT / SPECTRUM)* is a context element, which appears on the **INPUT** list in **1/1 OCTAVE** mode. Using the **SPECTRUM** sub-list one can select in **1/1 OCTAVE** analysis the weighting filter and enable saving 1/1 OCTAVE results in the logger's file of the instrument.

The following weighting filters are available in **1/1 OCTAVE** analysis:

- **A** type 1 according to the IEC 651 and IEC 61672-1 standards,
- **C** type 1 according to the IEC 651 and IEC 61672-1 standards,
- **Z** type 1 according to the IEC 61672-1 standard.



SPECTRUM windows with selection of the weighting filter

The characteristics of the filters are given in Appendix D. The selection of the required filter is made with the **<◄>**, **<►>** push-buttons. After pressing the **<ENTER>** push-button the user can confirm the selection and close the window. The return to the **INPUT** list is made also after pressing the **<ESC>** push-button but in this case the selection is ignored.

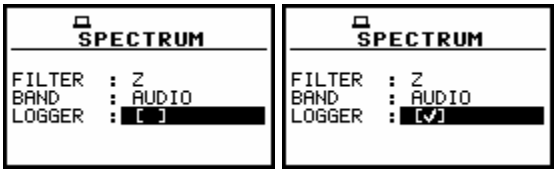
10.2.3 The 1/1 OCTAVE analysis band - BAND

In **SVAN 953** instrument the **1/1 OCTAVE** analysis is performed in so called **AUDIO** band, which consists of ten octaves starting from 31.5 Hz and ending at 16 kHz. The **BAND** position is not accessible.

10.2.4 Activation of saving results of the 1/1 OCTAVE analysis in the logger's file - LOGGER

The **RMS** results from **1/1 OCTAVE** analysis can be saved in the logger's file of the instrument. The enabling of **1/1 OCTAVE** spectrum in the **LOGGER** file is made by placing (**[√]**) or replacing (**[ ]**) the special character in the displayed inversely line with the **LOGGER** text by means of the **<◄>**, **<►>** push-buttons.

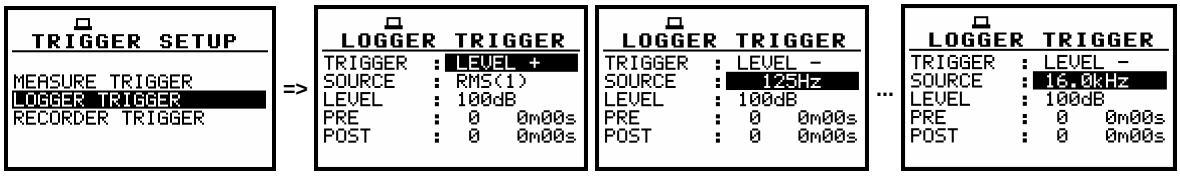
In order to confirm the selection the user has to press the **<ENTER>** push-button. This confirmation closes the **SPECTRUM** sub-list. The sub-list can be also closed after pressing the **<ESC>** push-button but the settings made there are ignored.



Spectrum windows with disabled and enabled savings of 1/1 OCTAVE spectrum

10.2.5 Selection of the result which triggers registration in logger in 1/1 OCTAVE analysis - LOGGER TRIGGER

In **SLM** mode only the result coming from the RMS detector of the first profile (**RMS(1)**) is used for triggering the measurement results registration in the logger of the instrument. The **SOURCE** position in the **LOGGER TRIGGER** window is not accessible in that mode. However, in **1/1 OCTAVE** analysis it is possible to access mentioned above position and to make a selection. The results coming from the output of **1/1 OCTAVE** filters, starting from 125 Hz (**125 Hz**, **250 Hz**, **500 Hz**, **1.00 kHz**, **2.00 kHz**, **4.00 kHz**, **8.00 kHz** and **16.0 kHz**), are available as well as **RMS** result from the first profile. Other **LOGGER SETUP** settings are identical as for the **SLM**.



LOGGER TRIGGER windows; the selection of the signal used for triggering

10.3 Display options in 1/1 OCTAVE analysis mode

The **DISPLAY** list is used for setting the various parameters, which are mainly dedicated for the control of the display. The following sub-lists contain the elements that influence the presentation of the results of **1/1 OCTAVE** analysis:

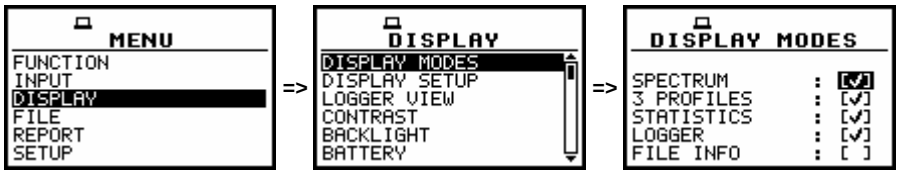
DISPLAY MODES enables one to select the mode of the presentation of **1/1 OCTAVE** analysis;

DISPLAY SETUP enables one to change the scale of the vertical and horizontal axis of the graphical presentation, switch on and off the grid, select one of the available views of the display and choose the type of the spectrum to be presented;

LOGGER VIEW enables one to select and present the results of the analysis stored in the files of the logger.

The **DISPLAY MODES** (*path: MENU / DISPLAY / DISPLAY MODES*) **enables the user to switch on or off the available modes of displaying the results of analysis**. The activation is made by placing and the deactivation by replacing the special character in the displayed inversely position of the **DISPLAY MODES** sub-list by means of the **<⮜>**, **<⮞>** push-buttons. In order to confirm the selection the user has to press the **<ENTER>** push-button. In order to change the presentation mode to be switched on or off the user has to press the **<⮝>** or **<⮟>** push-buttons. The following presentation modes are available: **one-profile**, **SPECTRUM**, **3 PROFILES**, **STATISTICS**, **LOGGER** and **FILE INFO**.

The user can change the current presentation mode of the analysis results by means of the **<⮝>**, and **<⮟>** push-buttons.

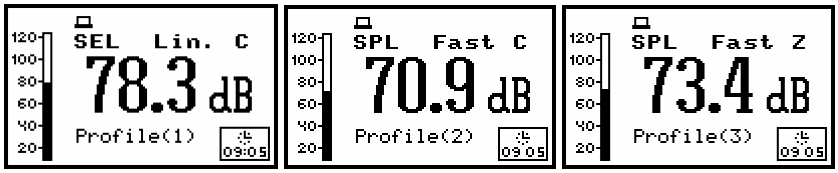


Main list, DISPLAY list and DISPLAY MODES window with available modes of presentation

***Notice**: **The user can switch on ([√]) or off ([ ]) the available presentation modes of the analysis results** (SPECTRUM, 3 PROFILES, STATISTICS, LOGGER, FILE INFO) in the **DISPLAY MODES** window (path: MENU / DISPLAY / DISPLAY MODES). One-profile mode cannot be switched off. See Chapter dealing with **DISPLAY** list for the details.*

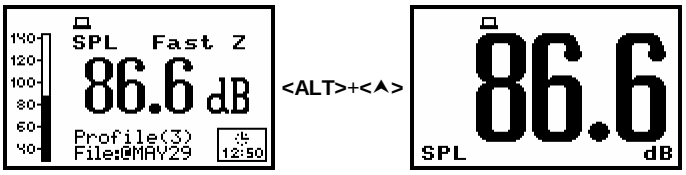
10.3.1 One-profile presentation mode in 1/1 OCTAVE analysis

In one-profile, the results are presented in the same way as in the case of the **SLM** mode. The active profile is changed after each pressing of the **<SHIFT>** and **<▲>** or **<▼>** push-buttons. The change of the result from the same profile is done by pressing the **<◄>**, **<►>** push-buttons.



Displays in 1/1 OCTAVE analysis in one-profile mode

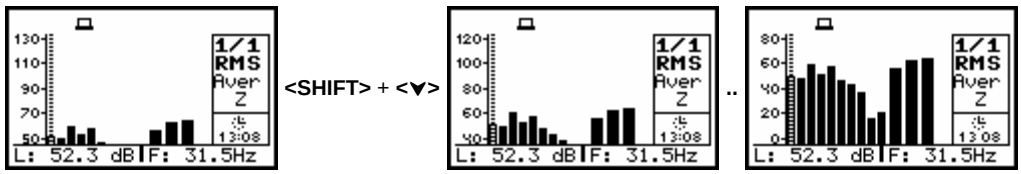
It is also possible to change the size of the characters in one-profile display mode by pressing **<ALT>** and **<▲>** or **<▼>** push-buttons.



Displays with the change of the size of characters in one-profile mode

10.3.2 Presentation of 1/1 OCTAVE analysis results - SPECTRUM

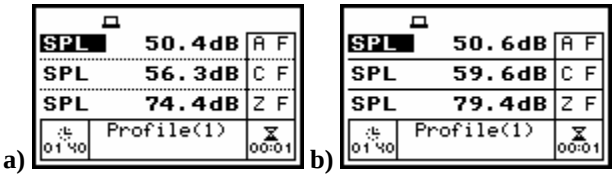
The basic view of the display presenting **1/1 OCTAVE** spectrum was already discussed. Additionally, in this view it is possible to shift the horizontal axis in relation to the vertical one using the **<SHIFT>** and **<▲>**, **<▼>** push-buttons. After each pressing of these buttons the presented picture is moved 10 dB down or up - respectively.



Displays in 1/1 OCTAVE analysis with the shifted horizontal axis in relation to vertical one

10.3.3 Three-profiles presentation mode in 1/1 OCTAVE analysis - 3 PROFILES

There is a slight difference in **3 PROFILES** mode between the **SLM** and **1/1 OCTAVE** analyser. Namely, in order to inform the user about the current function of the instrument, the **doted lines** are used in **3 PROFILES** for the indication that the instrument **does not work in** the **SLM** mode. In the **SLM** mode, the continuous lines are used.

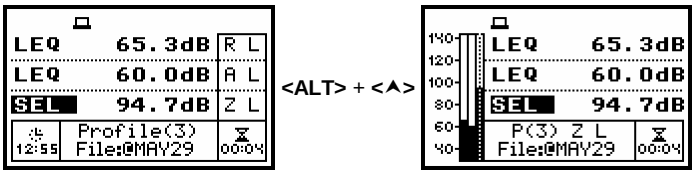


a) **b)**

3 PROFILES presentation mode with the doted lines stating the instrument does not work in SLM mode (a) and the continuous lines in SLM mode (b)

In **3 PROFILES** mode on the right side of the display the information about the weighting filter (**A**, **C**, **Z**) and indicator of the detector time constant or indicator of linear RMS integration (**S** - Slow, **F** - Fast,

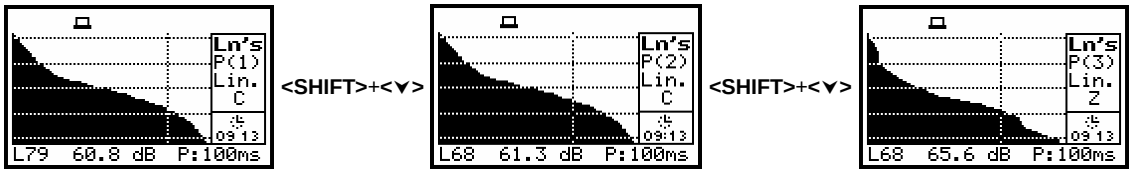
I -Impulse, **L** - Linear) are displayed. It is possible to change the view by pressing **<ALT>** and **<▲>** or **<▼>** push-buttons. After that change on the left side of the display the scale can be observed, and the information about the weighting filter and detector time constant are displayed in the first line below the measurement results.



Displays with the different 3 PROFILE presentation mode

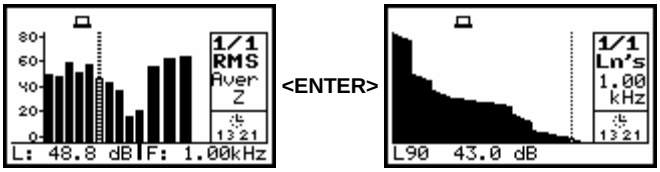
10.3.4 Statistical presentation mode in 1/1 OCTAVE analysis - STATISTICS

In the **STATISTICS** mode it is possible to select the **LN** value using the **<◄>**, **<►>** push-buttons. The active profile is presented on the right side of the display. The indicator of the weighting filter is displayed - in the fourth line. The **LN** corresponding to the current position of the cursor and the value of the **LN** displayed down together with the units. When the **STATISTICS** mode of result's presentation is entered (the **<▲>**, **<▼>** push-buttons are used for this purpose) in order to change the active profile the **<SHIFT>** and **<▲>** or **<SHIFT>** and **<▼>** push-buttons should be pressed.



Displays in 1/1 OCTAVE analysis with presentation of the statistical analysis in all profiles

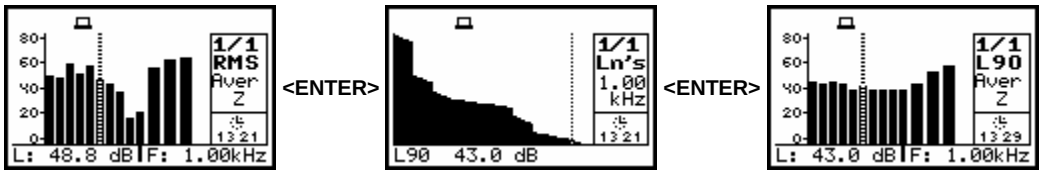
The statistical analysis is also performed in **1/1 OCTAVE** analysis. The results of this analysis, performed for one of **1/1 OCTAVE** bands selected by the cursor, are visible on the display after pressing the **<ENTER>** push-button in the case when **1/1 OCTAVE** spectrum was presented in the instrument. The centre frequency of the filter for which the analysis was made is showed on the right side of the display. The **LN** number corresponding to the cursor position, the **LN** value and the units are presented on the bottom of the display. The **LN** value can be changed by pressing the **<◄>**, **<►>** push-buttons.



1/1 OCTAVE spectrum and the statistical analysis performed for selected 1/1 OCTAVE band (here: 1 kHz)

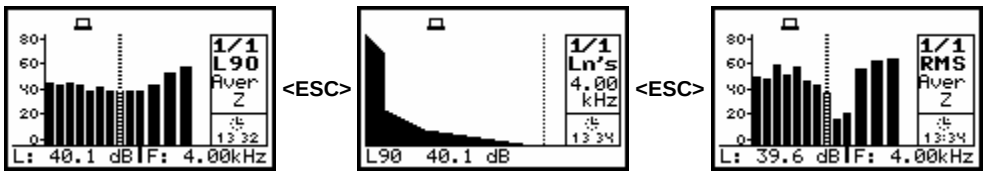
It is also possible to examine **1/1 OCTAVE** spectrum, calculated for the selected by the cursor **LN** statistical level, after pressing once more the **<ENTER>** push-button. The **LN** value (e.g. **L90**) for which the presented spectrum is given, the information about the **TYPE** of the spectrum (**Aver** - **AVERAGED**, **Inst** - **INSTANTANEOUS**, **MAX**, **MIN** - *path: MENU / DISPLAY / DISPLAY SETUP / SPECTRUM VIEW / TYPE*), the weighting filter (**A**, **C** or **Z** - *path: MENU / INPUT / SPECTRUM / FILTER*) and the real time clock (e.g. **13:21**) or the actual time of the recent measurement cycle in the case when the measurements are performed are presented on the right side of the display.

The centre frequency of the band for which the analysis was made, the value at the cursor position and the units are presented on the bottom of the display. On the left side of the display, the user can see the graduation (scale) of the vertical axis. The effect of two consecutive pressings of the **<ENTER>** push-button in the case of **1/1 OCTAVE** spectrum is given below.



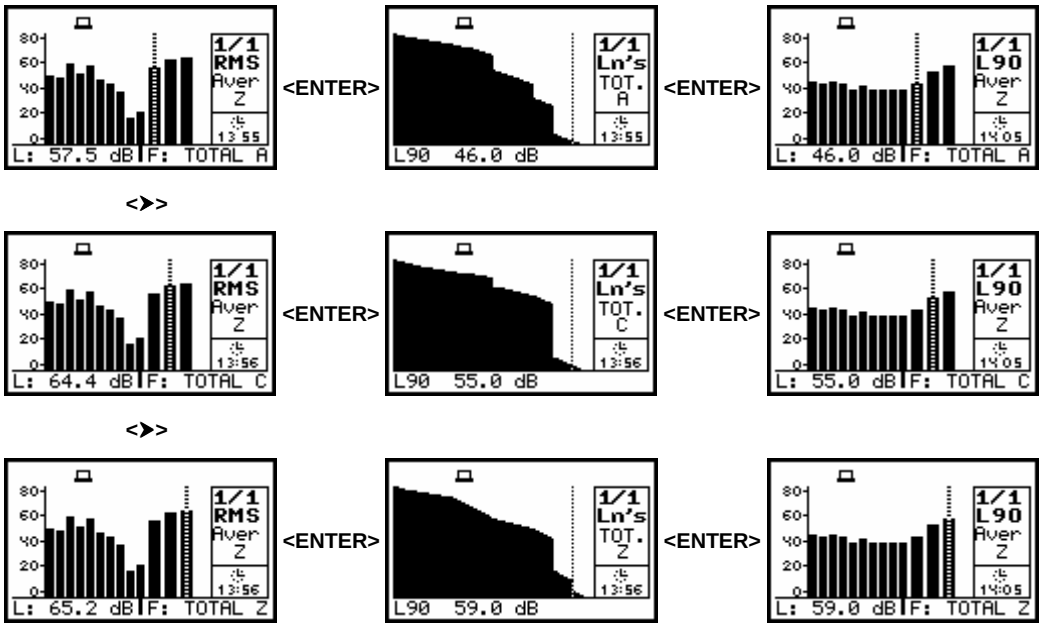
Displays with 1/1 OCTAVE spectrum, after entering the presentation of the statistical analysis results performed for the selected 1/1 OCTAVE filter and after entering 1/1 OCTAVE spectrum of the LN

The centre frequency of the band can be changed by pressing the **<◄>**, **<►>** push-buttons. After two consecutive pressings of the **<ESC>** push-button, in the case when the **LN** spectra are presented, the instrument returns to the presentation of **1/1 OCTAVE** spectrum.

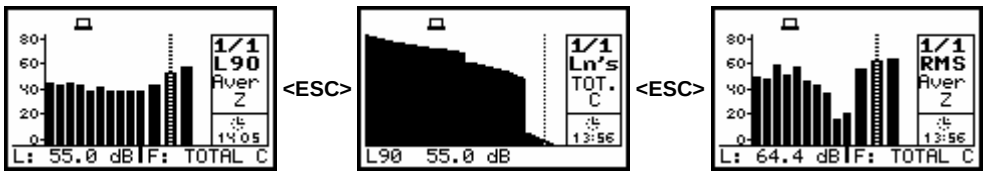


Displays with 1/1 OCTAVE spectrum of LN, after return to the presentation of the statistical analysis results performed for the selected 1/1 OCTAVE filter and after return to the presentation of 1/1 OCTAVE spectrum

The statistical analysis and **LN** spectra calculation is also made for all **TOTAL** values of **1/1 OCTAVE** analysis.



Presentation of the statistical analysis results performed for TOTAL results of 1/1 OCTAVE analysis



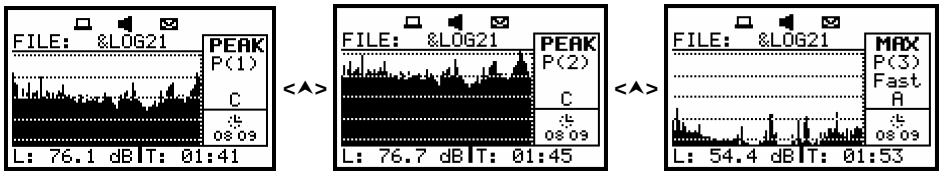
Displays after pressing <ESC> push-button in 1/1 OCTAVE spectrum of LN while TOTAL C value was selected and after another pressing of <ESC> push-button - return to presentation of 1/1 OCTAVE spectrum

10.3.5 Time history plot - LOGGER

In the **LOGGER** mode the user can see the time history plot with the results which are saved in the logger file (in the case when the **LOGGER x** positions is switched on (**[√]**) in the **PROFILE x** sub-lists with the step set for all profiles in the **LOGGER STEP** position - *path: MENU / INPUT / MEASUREMENT RANGE / LOGGER STEP*).

In this mode the user, after pressing the different push-buttons, can achieve the following results:

- **<▲>** or **<▼>** push-buttons - the change of the active profile
- **<ALT>** and **<▲>** or **<ALT>** and **<▼>** push-buttons - the change of the view type
- **<ALT>** and **<◄>** or **<ALT>** and **<►>** push-buttons - the change of the result saved in a profile (**PEAK**, **MAX**, **MIN**, **RMS**)
- **<◄>** or **<►>** push-buttons - the change of the position of the cursor on the display
- **<SHIFT>** and **<◄>** push-buttons - the cursor is moved to the left corner of the display
- **<SHIFT>** and **<►>** push-buttons - the cursor is moved to the right corner of the display
- **<SHIFT>** and **<▲>** push-buttons - the shift of the horizontal axis in relation to the vertical one; after each pressing the presented picture is moved 10 dB up
- **<SHIFT>** and **<▼>** push-buttons - the shift of the horizontal axis in relation to the vertical one; after each pressing the presented picture is moved 10 dB down



Displays in 1/1 OCTAVE analysis in LOGGER mode; registered results from all profiles

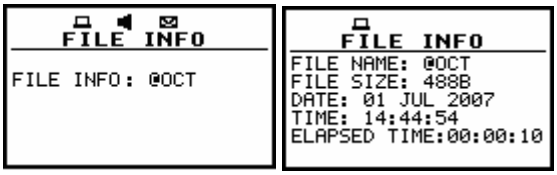
10.3.6 Basic data of the saved files - FILE INFO

In the **FILE INFO** window, the following information is presented:

- the file name
- the file size
- date of the registration of the main results (cf. App. B)
- time of the registration
- time (so-called **ELAPSED TIME**) during which the main results saved in the logger were measured.

The value presented in the **ELAPSED TIME** belongs to the interval [**1**, **INTEGRATION PERIOD**] and depends on the moment and the way the measurements were stopped.

During the measurement (when the **AUTO SAVE** option is active), at the display the user can see the name of the file being written.

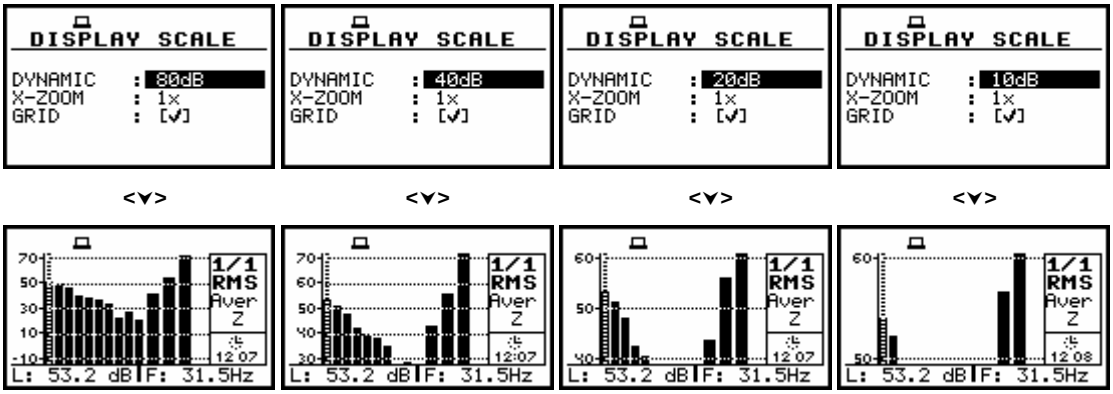


FILE INFO window with the name of the file being written and with information about already saved file

10.3.7 Scaling the vertical axis of graphical presentation - DYNAMIC

The **DYNAMIC** (*path: MENU / DISPLAY / DISPLAY SCALE / DYNAMIC*) enables the user to select the proper scaling of the graphical mode presentation. In the case of the vertical axis one can obtain the double, four-times and eight-times expansion (as the default the vertical axis corresponds to 80 dB,

after expansion it corresponds to 40 dB, 20 dB and 10 dB – respectively) using the **<◄>**, **<►>** push-buttons and pressing the **<ENTER>** for the confirmation.

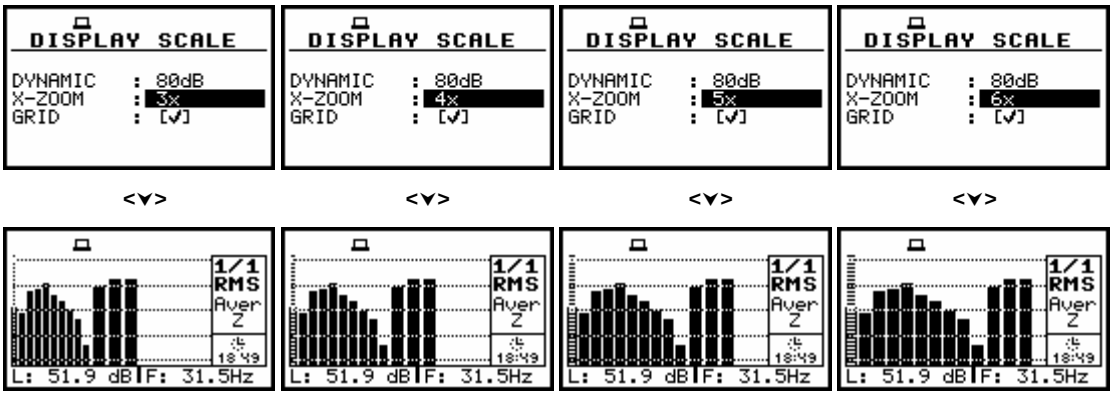


1/1 OCTAVE analysis results presented with different value of DYNAMIC selected in DISPLAY SCALE

10.3.8 Scaling the horizontal axis of graphical presentation - X–ZOOM

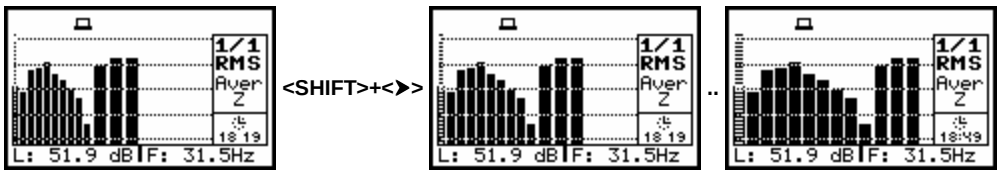
The **X–ZOOM** (*path: MENU / DISPLAY / DISPLAY SCALE / X–ZOOM*) enables the user to change the horizontal axis of the results of **1/1 OCTAVE** analysis by means of the **<◄>**, **<►>** push-buttons. The following values are available in this mode: **3x**, **4x, 5x** and **6x**.

In order to confirm the selection the user has to press the **<ENTER>** push-button, which closes the sub-list. The sub-list can be also closed after pressing the **<ESC>** push-button but the settings made there are ignored.



1/1 OCTAVE analysis results presented with different value of X–ZOOM selected in DISPLAY SCALE

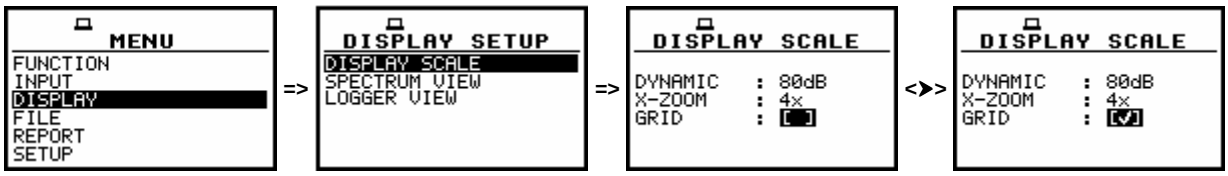
***Notice**: The same result (the horizontal extension or narrowing of the analysis results) can be achieved by pressing the **<SHIFT>** and **<◄>**, **<►>** push-buttons while 1/1 octave spectrum is presented on the display.*



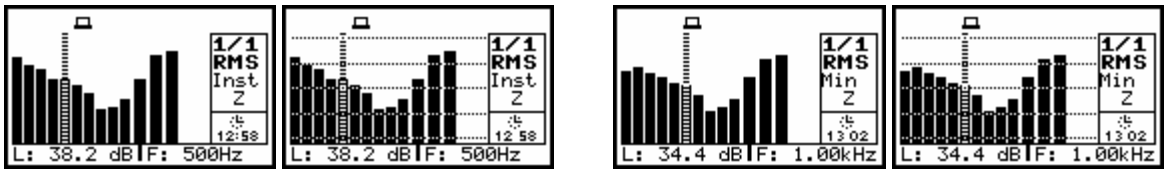
Displays in 1/1 OCTAVE SPECTRUM with different X–ZOOM parameter

10.3.9 Switching on/off the grid in the graphical presentation - GRID

The **GRID** (*path: MENU / DISPLAY / DISPLAY SCALE / X–ZOOM*) enables the user to switch on (**[√]**) or off (**[ ]**) the grid in any graphical presentation placing or replacing the special character in the displayed inversely line with the **GRID** text by means of the **<◄>**, **<►>** push-buttons. In order to confirm the selection the user has to press the **<ENTER>** push-button. This confirmation closes also the **DISPLAY SCALE** window. The window can be also closed after pressing the **<ESC>** push-button but the settings made there are ignored.



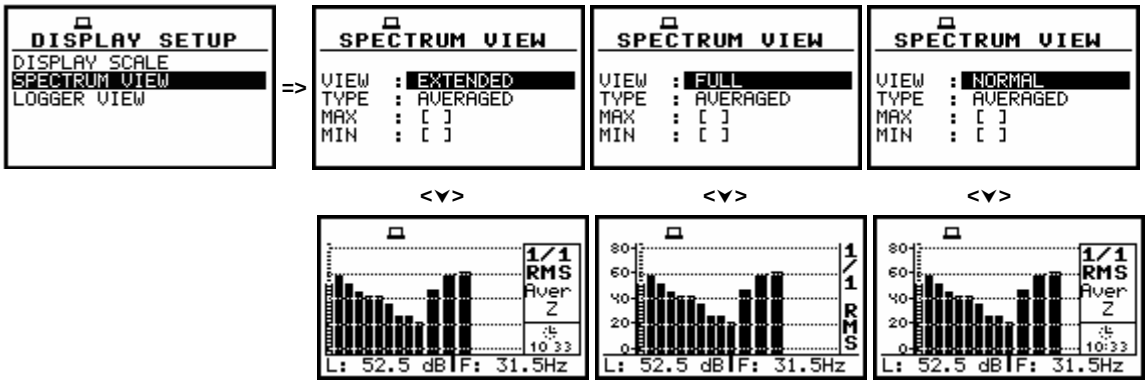
GRID option selection and switching it on and off



1/1 OCTAVE spectrum presented without and with GRID

10.3.10 View selection in 1/1 OCTAVE analysis - VIEW

The user can select the actually active view mode in the **VIEW** position of the **SPECTRUM VIEW** sub-list (*path: MENU / DISPLAY / DISPLAY SETUP / SPECTRUM VIEW / VIEW*) by means of the **<◄>**, **<►>** push-buttons. In order to confirm the selection the user has to press the **<ENTER>** push-button, which closes the sub-list. The sub-list can be also closed after pressing the **<ESC>** push-button but the settings made there are ignored.

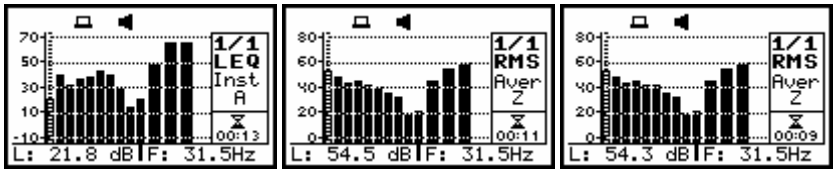


1/1 OCTAVE analysis results presented with different value of VIEW selected in SPECTRUM VIEW

***Notice**: The same result (change of the current view mode) can be achieved by pressing the **<ALT>** and **<▲>, <▼>** push-buttons while 1/1 octave spectrum is presented on the display.*

In so-called **NORMAL** view, on the right side of the display the user can see the text corresponding to the value presented on the bottom of the display for the band selected with the cursor (**1/1 RMS**, **1/1 LEQ**, **1/1 Max** or **1/1 Min**), the information about the type of the analysis result showed on display (**Aver** – **AVERAGED**, **Inst** - **INSTANTANEOUS**, **Max**, **Min** - *path: MENU / DISPLAY / DISPLAY SETUP / SPECTRUM VIEW / TYPE*), the weighting filter (**A**, **C** or **Z** - *path: MENU / INPUT / SPECTRUM / FILTER*) and the real time clock (e.g.: **10:33**) or the actual time of the recent measurement cycle in the case when

the measurements are performed (e.g.: **00:13**, **00:11**, **00:09** - cf. displays below). On the left side of the display the graduation (scale) of the vertical axis is given.



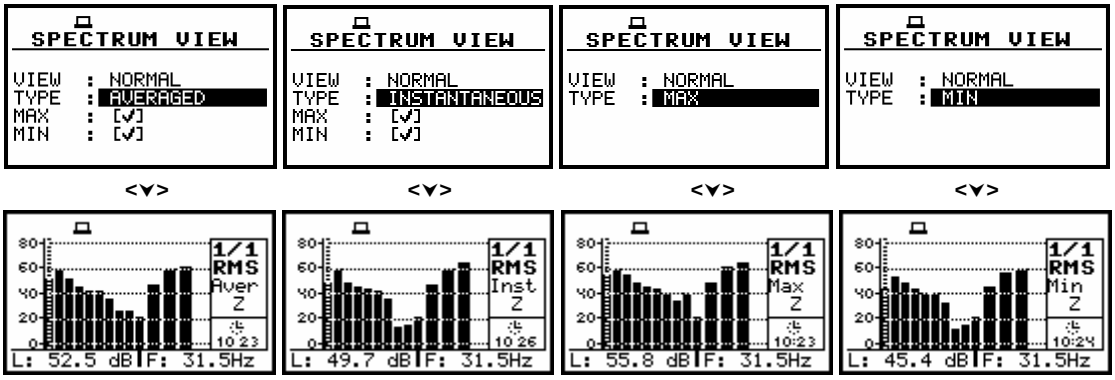
NORMAL view of the display with the results of 1/1 OCTAVE analysis actually performed

The **FULL** view looks nearly the same as the **NORMAL** one but the type of the analysis result showed on the display and the clock are taken off.

The **EXTENDED** view looks the same as **NORMAL** one with the exception of the graduation (scale) on the left side, which is not displayed.

10.3.11 Selection of the spectrum type for presentation - TYPE

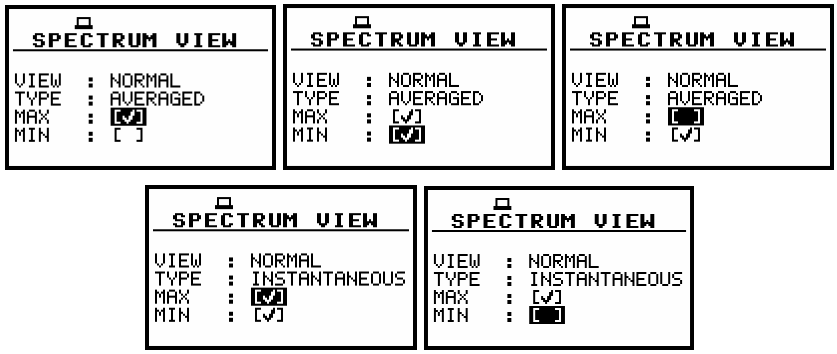
The user can select the different **1/1 OCTAVE** spectra to be visible on the display in the **TYPE** window (*path: MENU / DISPLAY / DISPLAY SETUP / SPECTRUM VIEW*) by pressing the **<➤>**, **<➤➤>** push-buttons. The following spectra are selectable: **AVERAGED**, **INSTANTANEOUS**, **MAX** or **MIN**.



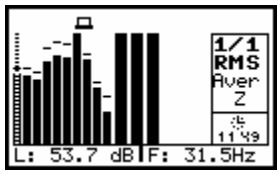
Presentation of different 1/1 OCTAVE spectra

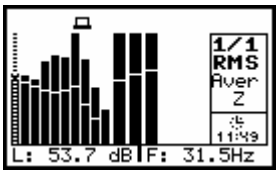
In the case when the **AVERAGED** or **INSTANTANEOUS** spectrum is selected the user can additionally switch on (**[√]**) or off (**[ ]**) the presentation of **MAX** and/or **MIN** spectrum by placing or replacing the special character in the displayed inversely line with the **MAX** or **MIN** text by means of the **<➤>**, **<➤➤>** push-buttons.

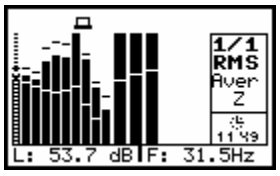
In order to confirm the selection the user has to press the **<ENTER>** push-button. This confirmation closes the **SPECTRUM VIEW** sub-list. The sub-list can be also closed after pressing the **<ESC>** push-button but the settings made there are ignored.



Displays with MAX and/or MIN spectrum switched on and off

a) 

b) 

c) 

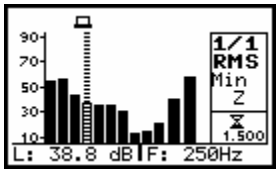
Displays with MAX (a), MIN (b) or both, MAX and MIN (c) spectra presented together with averaged one

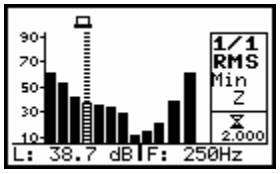
10.3.12 Presentation of logged 1/1 OCTAVE spectra - LOGGER VIEW

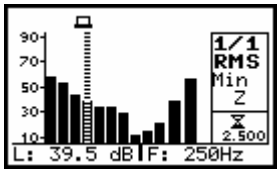
The spectra registered in the logger's file can be presented on the display in the **LOGGER VIEW** window *(path: MENU / DISPLAY / LOGGER VIEW).* These spectra are saved with the same step as selected in the **SLM** profiles (see the description of the **LOGGER STEP** - *path: MENU / INPUT / MEASUREMENT SETUP/LOGGER STEP*).

In order to display the registered in the logger's file spectra the user has to select required logger file in **LOGGER VIEW** window and press **<ENTER>**, select the spectrum presentation mode by pressing **<▼>** push-button and then:

- press the **<SHIFT>** and **<➤>** push-buttons for the spectra registred later;
- press the **<SHIFT>** and **<◄>** push-buttons for the spectra registred earlier.



<SHIFT>+<➤> 

<SHIFT>+<➤> 

Displays with 1/1 OCTAVE spectra saved in the logger with 500 ms step